Bpertussis	1	MSRIVNCVKLKREAEGLDFPPYPGELGTRIWQQISKEAWEEWKQIQTRLVNENRLNLADA
Bparapert	1	MSRIVNCVKLKREAEGLDFPPYPGELGTRIWQQISKEAWEEWKQIQTRLVNENRLNLADA
Bbronchi	1	MSRIVNCVKLKREAEGLDFPPYPGELGTRIWQQISKEAWEEWKQIQTRLVNENRLNLADA
A.actin	1	MARMVFCERLKQEAEGLDFQLYPGELGKRIFDSISKQAWGEWMKKQTMLVNEKKLNMMNA
Pmultocida	1	MARTVFCEYLKQESEGLDFQLYPGELGKRIFDSISKQAWREWMKKQTMLVNEKKLNMMNA
Hinfluenzae	1	MARTVFCEYLKKEAEGLDFQLYPGELGKRIFDSVSKQAWGEWIKKQTMLVNEKKLNMMNA
Hducreyi	1	MARMVFCEYLKKEAEGLDFQLYPGELGKRIFNSISKQAWAEWIKKQTMLVNEKKLNMMNP
Sputrefasciens	1	MARTVNCVHLNKEADGLDFQLYPGDLGKRIFDNISKEAWGLWQKKQTMLINEKKLNMMNV
Vcholerae	1	MARTVFCTRLQKEADGLDFQLYPGELGKRIFDNICKEAWAQWQTKQTMLINEKKLNMMDP
Ecoli	1	MSRTIFCTFLQREAEGQDFQLYPGELGKRIYNEISKEAWAQWQHKQTMLINEKKLNMMNA
O157_H7EDL933	1	MSRTIFCTFLQREAEGQDFQLYPGELGKRIYNEISKEAWAQWQHKQTMLINEKKLNMMNA
O157_H7	1	MSRTIFCTFLQREAEGQDFQLYPGELGKRIYNEISKEAWAQWQHKQTMLINEKKLNMMNA
Spara	1	MSRTIFCTYLQRDAEGQDFQLYPGELGKRIYNEISKDAWAQWQHKQTMLINEKKLNMMNA
Senteritidis	1	MSRTIFCTYLQRDAEGQDFQLYPGELGKRIYNEISKDAWAQWQHKQTMLINEKKLNMMNA
Sdublin	1	MSRTIFCTYLQRDAEGQDFQLYPGELGKRIYNEISKDAWAQWQHKQTMLINEKKLNMMNA
StyphiCT18	1	MSRTIFCTYLQRDAEGQDFQLYPGELGKRIYNEISKDAWAQWQHKQTMLINEKKLNMMNA
Styphimurium	1	MSRTIFCTYLQRDAEGQDFQLYPGELGKRIYNEISKDAWAQWQHKQTMLINEKKLNMMNA
Kpneumo	1	MSRTIFCTFLQREADGQDFQLYPGELGKRIYNEISKEAWAQWQHKQTMLINEKKLSMMNP
Ypesits	1	MSRTIFCTFLKKDAERQDFQLYPGEIGKRIYNEISKEAWSQWITKQTMLINEKKLSMMNI
Buchnera	1	MNRIIFCTFFKKKSEGQDFQSYPGKLGKKIYDQISKKAWEKWIEKQTILINEENLNMFNL
Xfastidiosa	1	MQRIIFCEYEQRDTEGLDFVPYPGELGQKIFACIGKVGWAAWLVHQTMLINENRLSPRNP
Psyring	1	MTRTVMCRKYKEELPGLERAPYPGAKGEDIFNHVSQKAWADWQKHQTLLINERRLNMMNA
Pputida	1	MTRTVMCRKYQEELPGLERPPYPGAKGQDIFEHISQKAWADWQKHQTMLINEKRLNMMNA
Paeruginosa	1	MSRTVMCRKYHEELPGLDRPPYPGAKGEDIYNNVSRKAWDEWQKHQTMLINERRLNMMNA
Ngonorrhoeae	1	MARMVFCVKLNKEAEGMKFPPLPNELGKRIFENVSQEAWAAWTRHQTMLINENRLSLADP
NmeningitB	1	MARMVFCVKLNKEAEGMKFPPLPNELGKRIFENVSQEAWAAWTRHQTMLINENRLSLADP
NmeningitA	1	MARMVFCVKLNKEAEGMKFPPLPNELGKRIFENVSQEAWAAWTRHQTMLINENRLSLADP
Bmallei	1	MARMIHCAKLGKEAEGLDFPPLPGELGKRLYESVSKQAWQDWLKQQTMLINENRLNMADP
Bpseudomallei	1	MARMIHCAKLGKEAEGLDFPPLPGELGKRLYESVSKQAWQDWLKQQTMLINENRLNMADP
Tferrooxidans	1	MSRMVQCVKLGHEAEGLDRPPYPGALGARIYQEVSKEAWQGWLKHQTMLINEYRLSPIDP
Mcapsulatus	1	MARRIICAKLGIEADGLDAPPFPGPQGQRIFEHVSKEAWQDWLKLQTMLINEHRLTPFEA
Cburneti	1	MTRRIICQKLGKEADALNYSPYPGELGERIYNHISEQAWQAWLSHQTMLINEYRLSLIDP

Fig. 1A

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Bpertussis        61  RARKYIQQQMERFLFEDGTVEAQGYVP----
Bparapert         61  RARKYIQQQMERFLFEDGTVEAQGYVP----
Bbronchi          61  RARKYIQQQMERFLFEDGTVEAQGVP-----
A.actin           61  EHRKLIEQEMVNFLFEGKDVHIEGYTPPEAK
Pmultocida        61  DHRQLIEQEMVNFLFEGKDVHIEGYVP----
Hinfluenzae       61  EHRKLIEQEMVNFLFEGKDVHIEGYVP----
Hducreyi          61  EHRQLIEAEMVNFLFEGKDVHIDGYVP----
Sputrefasciens    61  DDRKFIEAQMTSFLFEGKDVEIEGFVPE---
Vcholerae         61  EHRKLIEQEMVNFLFEGKEVHIEGYTPPAK-
Ecoli             61  EHRKLIEQEMVNFLFEGKEVHIEGYTPEDKK
O157_H7EDL933     61  EHRKLIEQEMVNFLFEGKEVHIEGYTPEDKK
O157_H7           61  EHRKLIEQEMVNFLFEGKEVHIEGYTPEDKK
Spara             61  EHRKLIEQEMVSFLFEGKDVHIEGYTPEDKK
Senteritidis      61  EHRKLIEQEMVSFLFEGKDVHIEGYTPE---
Sdublin           61  EHRKLIEQEMVSFLFEGKDVHIEGYTPEDKK
StyphiCT18        61  EHRKLIEQEMVSFLFEGKDVHIEGYTPEDKK
Styphimurium      61  EHRKLIEQEMVSFLFEGKDVHIEGYPTEDKK
Kpneumo           61  EHRKLIEQEMVQFLFEGK-------------
Ypesits           61  EDRKLIEQEMVNFLFEGQDVHIAGYTPPSK-
Buchnera          61  EHRKKIEKYMKLFLFK---------------
Xfastidiosa       61  SHRAFIEEELNKFLFERRVAKPEGYIEPD--
Psyring           61  EDRKFIQTEMDKFLSGEEYAQAEGYVPPEK-
Pputida           61  EDRKFIQAEMDKFFAGEEYAQAEGYVP----
Paeruginosa       61  EDRKFIQQEMDKFLSGEDYAKADGYVP----
Ngonorrhoeae      61  RAREYIAQQMEQYFFGDGADAVQGYVPQ---
NmeningitB        61  RAREYIAQQMEQYFFGDGADAVQGYVPQ---
NmeningitA        61  RAREYIAQQMEQYFFGDGADAVQGYVPQ---
Bmallei           61  RARQYIMKQTEKYFFGEGADQASGYVP----
Bpseudomallei     61  RARQYIMKQTEKYFFGEGADQASGYVP----
Tferrooxidans     61  KSRTFIEKQMEAYFFGDGAQSPEGYVP----
Mcapsulatus       61  SARKFIEQEREKFLFGGGTSTPQGYVP----
Cburneti          61  KARQFIEQEMINFLFGTGSEKPAGYTSE---
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Fig. 1A (continued)

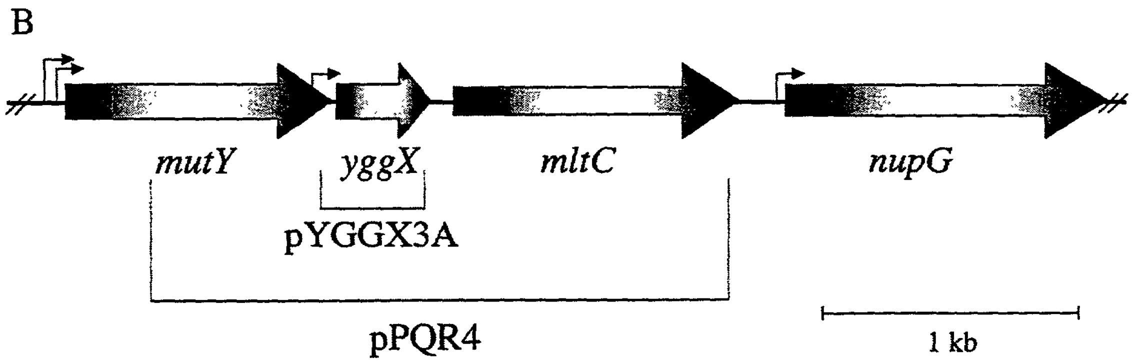

Fig. 1. Physical parameters of *yggX* and its gene product. (*A*) Alignment of YggX homologs. (*B*) Operon structure of *mutY*/*yggX* in *E. coli* and *S. enterica* LT2. Promoters were mapped by Gifford and Wallace in *E. coli* (43).

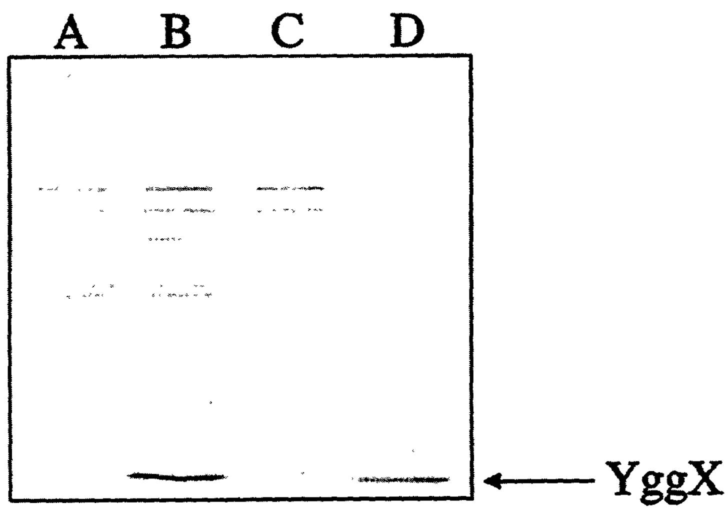

Fig. 2. Increased levels of YggX protein in *yggX** mutant. Western blot analysis was performed according to Harlow and Lane (59). Proteins were visualized by using alkaline phosphatase conjugated to anti-rabbit secondary antibody (Promega). Lanes A–C were loaded with crude cell-free extracts (1 μg protein) from strains DM5104, DM5105 (*yggX**), and DM5647 (*yggX*::Gm), respectively. Lane D was loaded with 1 ng purified YggX.

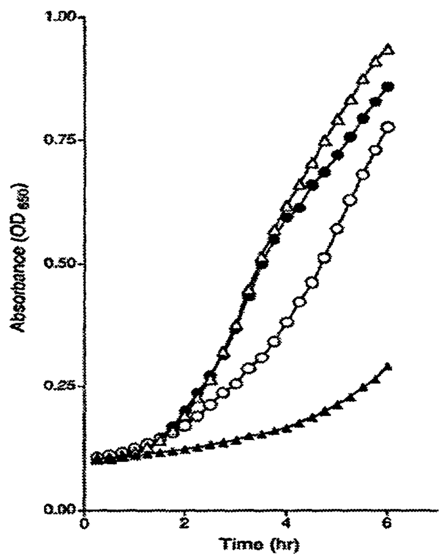

Fig. 3. The *yggX** mutation does not increase MNNG resistance of *gshA* mutants. Strain LT2 was grown in LB with (▲) and without (△) 60 μM MNNG. Both *gshA* (○) and *gshA yggX** (●) mutant strains were grown in LB with 60 μM MNNG.

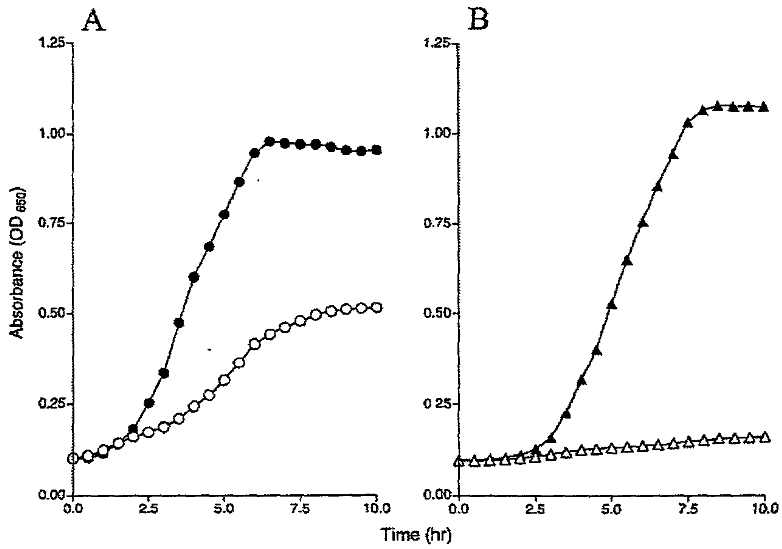

Fig. 4. The *yggX** mutation increases resistance of *S. enterica* to PQ. (*A*) Growth of *gshA* (○) and *gshA yggX** (●) mutant strains in LB with 4 μM PQ. (*B*) Growth of LT2 (△) and *yggX** (▲) strains in LB with 40 μM PQ.

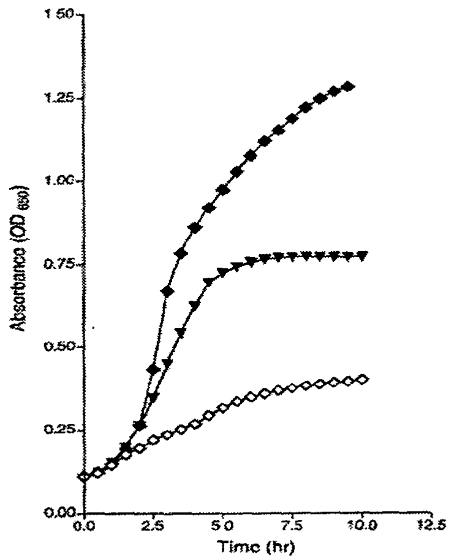

Fig. 5. yggX* does not require soxR to mediate resistance to PQ. Strains LT2 (◆), *soxR* (◇), and *soxR yggX** (▼) were grown in LB with 4.0 μM PQ.

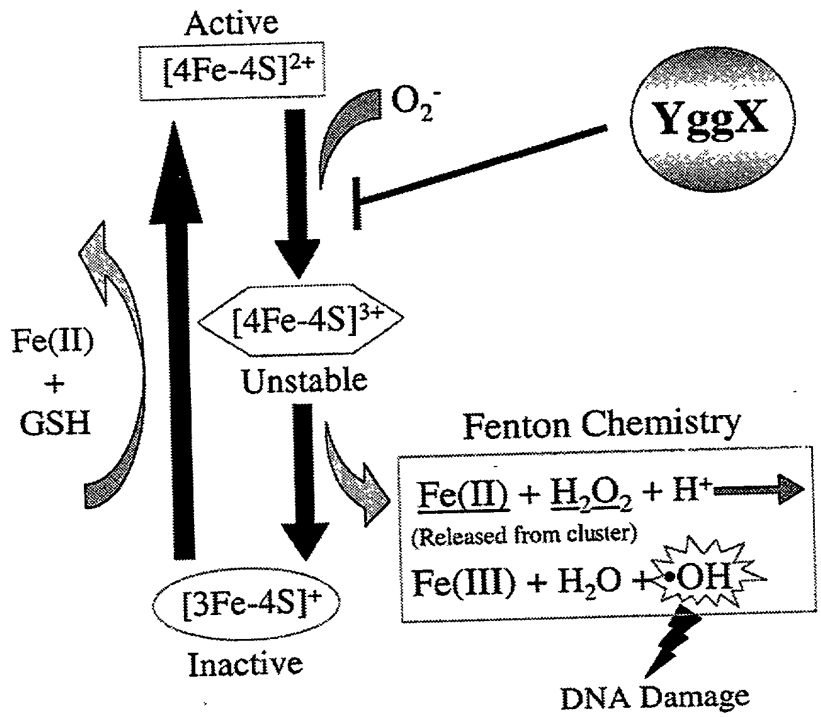

Fig. 6. Model showing how YggX protects *S. enterica* from oxidative damage. The result of superoxide attack on [Fe-S] clusters is depicted. We hypothesize that YggX is able to block oxidative damage to labile clusters and thus prevent the normal downstream consequences of such oxidation.